IN THE CLAIMS

1. (currently amended) A method for enabling the execution of ~~at least an~~ I/O

operations by at least a host on at least a production storage element while ~~providing~~ producing

an updated ~~a~~ snapshot copy of ~~a storage system~~ said production storage element, said method

comprises the steps of:

a) performing on-line ~~at least a primary task of said I/O operation~~ a write request initiated

by said host by writing a data chunk , ~~wherein said primary task is performed using~~ to a journal;

b) generating a response message ending the execution of said ~~I/O operation~~ write request

and thereby handling said host to execute said I/O operations; and,

c) off-line ~~performing off-line secondary tasks of said I/O operation~~ producing said

updated snapshot copy of said production storage element.

2. - 4. (Cancelled)

5. (Original) The method of claim 1, wherein said journal includes at least one non-

volatile random access memory (NVRAM) unit.

6. (Cancelled)

7. (Currently Amended) The method of claim ~~6~~ 1, wherein ~~said~~ performing on-line

said write request ~~at least a primary task~~ further comprises the step[[s]] of:

~~a) writing a data chunk included in said write request into said journal; and,~~

~~b)~~ saving a destination address designated in said write request in a changes table.

84146217_1

8.   (Cancelled)

9.   (Currently Amended) The method of claim 6 7, wherein said performing off-line producing secondary tasks said updated snapshot copy further comprises the steps of:

a) checking in said changes table if said data chunk residing in the a snapshot storage element that includes said updated snapshot copy was modified since a last time that said updated snapshot copy was updated created;

b) copying said data chunk from a location in the said production storage element to said snapshot storage element and further copying said data chunk from said journal to a location in said production storage element, if said data chunk has not been modified; and,

c) copying said data chunk from said journal to said production storage element, if said data chunk has been modified.

10.   (Currently Amended) The method of claim 9, wherein the said location in said production storage element is determined by said destination address.

11.   (Original) The method of claim 10, wherein said destination address is converted to a physical address if said production storage element is a virtual volume.

12.   (Currently Amended) The method of claim 1, wherein said I/O operations comprise is a read request initiated by the host computer.

84146217_1

13.   (Currently Amended) The method of claim 12, wherein ~~said~~ <u>executing said read</u>

<u>request</u> ~~performing on line at least a primary task further~~ comprises the steps of:

a) checking if a data chunk requested to be read resides in said journal; ~~and;~~

b) retrieving said data chunk from said journal and further sending said data chunk to said

host, if said data chunk resides in said journal<u>; and</u> ~~.~~

<u>c) retrieving said data chunk from said production storage element and further sending</u>

<u>said data chunk to said host, if said data chunk does not reside in said journal.</u>

14.   (Original) The method of claim 13, wherein checking if said data chunk resides

in said journal further comprises the step of:

checking whether the changes table includes an entry associated with said data chunk.

15.   (Cancelled)

16.   (Currently Amended) The method of claim ~~15~~<u>14</u>, wherein said data chunk is

retrieved from a location designated by a source address included in said read request.

17.   (Original) The method of claim 16, wherein said source address is converted to a

physical address if said production storage element is a virtual volume.

18.   (Currently Amended) A computer-readable medium having stored thereon

computer executable code enabling the execution of ~~at least an~~ I/O operation<u>s</u> <u>by at least a host</u>

<u>on at least a production storage element</u> while <u>producing an updated</u> ~~providing a~~ snapshot copy

84146217_1

of said production storage element a storage system, said executable code for performing the steps of:

a) performing on-line a write request initiated by said host by writing a data chunk to at least a primary task of said I/O operation, wherein said primary task is performed using a journal;

b) generating a response message ending the execution of said write request and thereby handling said host to execute said I/O operations I/O operation; and,

c) off-line producing said updated snapshot copy of said production storage element performing off-line secondary tasks of said I/O operation.

19. - 21.   (Cancelled)

22.   (Original) The computer executable code of claim 18, wherein said journal includes at least one non-volatile random access memory (NVRAM) unit.

23.   (Cancelled)

24.   (Currently Amended) The computer executable code of claim 23 18, wherein said performing on-line said write request at least a primary task further comprises the step[[s]] of:

a) writing a data chunk included in said write request into said journal; and,

b) saving a destination address designated in said write request in a changes table.

25.   (Cancelled)

84146217_1

26.   (Currently Amended) The computer executable code of claim ~~23~~24, wherein ~~said~~

~~performing~~ off-line producing said updated snapshot copy ~~secondary tasks~~ further comprises the

steps of:

a) checking in said changes table if said data chunk resides in ~~the~~ a snapshot storage

element that includes said updated snapshot copy was modified since a last time that said

updated snapshot copy was update~~created~~;

b) copying said data chunk from a location in said ~~the~~ production storage element to said

snapshot storage element and further copying said data chunk from said journal to a location in

said production storage element, if said data chunk has not been modified; and,

c) copying said data chunk from said journal to said production storage element, if said

data chunk has been modified.

27.   (Currently Amended) The computer executable code of claim 26, wherein said

~~the~~ location in said production storage element is determined by said destination address.

28.   (Original) The computer executable code of claim 27, wherein said destination

address is converted to a physical address if said production storage element is a virtual volume.

29.   (Currently Amended) The computer executable code of claim 18, wherein said

I/O operations comprise ~~is~~ a read request by the host.

30.   (Currently Amended) The computer executable code of claim 29, wherein ~~said~~

executing said read request ~~performing at least a primary task~~ further comprises the steps of:

a) checking if a data chunk requested to be read resides in said journal; ~~and~~

b) retrieving said data chunk from said journal and further sending said data chunk to said

host, if said data chunk resides in said journal; and

c) retrieving said data chunk from said storage element and further sending said data

chunk to said host, if said data chunk does not reside in said journal.

31.   (Original) The computer executable code of claim 30, wherein checking if said

data chunk resides in said journal further includes:

checking whether the changes table includes an entry associated with said data chunk.

32.   (Cancelled)

33.   (Currently Amended) The computer executable code of claim ~~32~~31, wherein said

data chunk is retrieved from a location designated by a source address included in said read

request.

34.   (Original) The computer executable code of claim 33, wherein said source

address is converted to a physical address if said production storage element is a virtual volume.

84146217_1

35.   (Currently Amended) An apparatus for execution of ~~at least an~~ I/O operation<u>s</u>

with <u>by at least a host on at least a production storage element</u> ~~minimal latency~~ while ~~providing~~

an <u>producing an updated</u> snapshot copy of <u>said production storage element</u> ~~storage system~~, said

apparatus comprising:

means for receiving ~~said a at least an I/O~~ <u>write request</u> operation from <u>said</u> host;

means for performing on-line ~~at~~ <u>said write request by writing a data chunk to a</u>

journal~~least one primary task of said at least an I/O operation~~;

means for ~~performing~~ off-line <u>producing said updated snapshot copy of said production</u>

<u>storage element</u>~~at least a secondary task of said at least an I/O operation~~;

means for controlling a snapshot storage element;

means for controlling a production storage element; and,

means for controlling a journal.

36.   (Original) The apparatus of claim 35, wherein said snapshot storage element is at

least one of: a virtual volume, a physical storage device.

37.   (Original) The apparatus of claim 35, wherein said production storage element is

at least one of: a virtual volume, a physical storage device.

38.   (Original) The apparatus of claim 35, wherein said physical storage device

comprises at least one of: tape drive, tape library, optical drive, disk, redundant array of

independent disks (RAID).

84146217_1

39. (Original) The apparatus of claim 35, wherein said journal includes at least one

non-volatile random access memory (NVRAM) unit.

40. (Currently Amended) The apparatus of claim 35, wherein said I/O operations

comprise at least ~~one of: write request,~~ a read request.

41. (Cancelled)

42. (Original) The apparatus of claim 35, wherein said apparatus is a storage

controller.

43. (Original) The apparatus of claim 35, wherein said apparatus is a virtualization

switch connected in a storage area network (SAN).

44. (Cancelled)

45. (Currently Amended) The apparatus of claim ~~44~~40, wherein executing said read

request ~~said performing said primary task further~~ comprises the steps of:

a) checking if a data chunk requested to be read resides in said journal; ~~and,~~

b) retrieving said data chunk from said journal and further sending said data chunk to said

host, if said data chunk resides in said journal.~~-~~; and

c) retrieving said data chunk from said storage element and further sending said data

chunk to said host, if said data chunk does not reside in said journal.

84146217_1

46.   (Currently Amended) The apparatus of claim 45, wherein checking if said data

chunk resides in said journal further comprises:

checking whether ~~the~~ a changes table includes an entry associated with said data chunk.

47. - 48.   (Cancelled)

49.   (Currently Amended) The apparatus of claim 48~~35~~, wherein said performing on-

line ~~at least a primary task~~ said further comprises the steps of:

a) ~~writing a data chunk included in said write request into said journal;~~

b) saving a destination address designated in said write request in a changes table; and,

c) sending a response message ending the execution of said write request to said host.

50.   (Currently Amended) The apparatus of claim 48~~49~~, wherein ~~said performing off-~~

line ~~secondary tasks~~ producing said updated snapshot copy further comprises the steps of:

a) checking in a change table if said data chunk resides in the snapshot storage element

was modified since a last time said updated snapshot copy was ~~created~~updated;

b) copying said data chunk from a location in ~~the~~ said production storage element to said

snapshot storage element and further copying said data chunk from said journal to a location in

said production storage element, if said data chunk has not been modified; and,

c) copying said data chunk from said journal to said production storage element, if said

data chunk has been modified.

84146217_1